

AEN1107 ELECTRICAL ENGINEERING I

Lecturer(s) Dr. Lugujo E. B.Sc. (Eng), M.Sc. (Eng), PhD
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Course Type: CORE (AGE. I)

1. COURSE DESCRIPTION

Course Credits (CU): 4 CU i.e. 60 Contact Hours per semester

Course Duration: 15 weeks (60 hours) i.e. 45 LH, 30 PH/TH

The course introduces students to basic electrical engineering aspects applicable to agricultural/ mechanical engineers. It covers: key concepts in DC circuits, electrical power supply and electronics.

2. COURSE OBJECTIVES

The course aims at equipping students with skills and knowledge in basic electrical engineering aspects in an effort to help students overcome electrical engineering challenges in the field of agricultural engineering.

The specific objectives are to:

- i) Provide students with sufficient theoretical background in DC circuits and electronics necessary for good practice of agricultural engineering.
- ii) Introduce students to the various aspects in electrical power supply technologies.
- iii) Equip students with electrical wiring and electronic device trouble shooting skills necessary for sound agricultural engineering practice.
- iv) Enable students to apply and integrate various electrical engineering procedures in real life situations.

3. RECOMMENDED REFERENCES FOR READING

1. Edminister J.A, 1983. Theory and Problems of Electric circuits. McGraw-hill book company Singapore
2. Irwin J. D. and Kerns D.V.J. (1995). Introduction to Electrical Engineering. Prentice Hall.
3. Mulukutla Sarma (2001). Introduction to Electrical Engineering. OxfordUniversity Press

4. COURSE CONTENT, METHODS OF INSTRUCTION, TOOLS AND EQUIPMENT REQUIRED

TOPIC	CONTENT	METHOD OF INSTRUCTION / Time allocated	TOOLS / EQUIPMENT NEEDED
1. Circuit Concepts	<ul style="list-style-type: none">• Electrical quantities• Lumped circuit elements• Kirchoff's laws• Meters and measurements• Analogue between electrical & other non electrical physical systems.	(4hrs)	Course notes, course reader materials, student scratch book

2. Circuit Analysis Techniques	<ul style="list-style-type: none"> ● Thevenin and Norton equivalent circuits ● Node – Voltage and Mesh current analyses ● Superposition and non linearity ● Wye – Delta circuit analysis ● Computer aided circuit analysis - Matlab 	(4hrs)	Course notes, course reader materials, student scratch book
3. Time dependent circuit analysis	<ul style="list-style-type: none"> ● Time dependent circuit analysis ● Sinusoidal steady state phasor analysis ● Transient Circuits ● Frequency response 	(4hrs)	Course notes, course reader materials, student scratch book
4. Three phase circuits and residential wiring	<ul style="list-style-type: none"> ● Three phase source voltages and phase sequences ● Balanced three phase loads ● Measurement of power ● Residential wiring and safety considerations 	(4hrs) Individual Written assignment (2hrs)	Course notes, course reader materials, student scratch book Assignment sheets
5. Analog building blocks and operational amplifiers	<ul style="list-style-type: none"> ● Amplifier block ● Ideal operational amplifier ● Practical properties of operational amplifiers ● Applications of operational amplifiers 	(4hrs)	Course notes, course reader materials, student scratch book
6. Diodes	<ul style="list-style-type: none"> ● Terminal characteristics of semi-conductor diodes ● Circuit analysis for an ideal diode ● Graphical circuit analysis ● Equivalent circuits for non ideal diodes ● Rectifier applications ● Waveform filtering ● Clipping and clamping operations ● Zener diodes ● Vacuum diodes 	(4hrs)	Course notes, course reader materials, student scratch book

7. Bipolar junction transistors	<ul style="list-style-type: none"> • Construction and the symbols of the BJT • Common base terminal characteristics • Common emitter terminal characteristics • Current flow and amplification • Constant emitter current bias • DC load line and collector bias • Capacitors and AC load lines • Amplifier classes • Hybrid parameter equivalent circuits • Power and efficiency of amplifiers 	(8hrs)	Course notes, course reader materials, student scratch book
8. Field effect transistors	<ul style="list-style-type: none"> • Construction and the symbols of the JFET • Terminal characteristics of the JFET • Bias line and load line • Graphical analysis of the JFET amplifiers • Small signal equivalent circuits of the JFET 	(4hrs)	Course notes, course reader materials, student scratch book
9. Digital circuits	<ul style="list-style-type: none"> • Transistor switches • DTL and TTL logic circuits • CMOS and other logic families 	(4hrs)	Course notes, course reader materials, student scratch book
10. AC power systems	<ul style="list-style-type: none"> • Introduction to Power systems • Single and three phase systems • Power transmission and distribution 	(5hrs)	Course notes, course reader materials, student scratch book

Practicals – 30hrs

Voltage division and the Wheatstone bridge configuration.

Function generator and oscilloscope.

Resistors and capacitors

Basic operational amplifiers.

Digital logic circuits.

Diodes / rectifiers.

5. OVERALL COURSE EVALUATION

Continuous Assessment Test	30%
Individual and Group Based Assignments	10%
Final examination	60%.